

The Effects of Non-Performing Loans (NPLs) and the Loan-to-Deposit Ratio (LDR) on Return on Assets (ROA) of State-Owned Banks Listed on the Indonesia Stock Exchange, 2022–2025

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Abstract

Keywords:

Return on Assets (ROA); Non-Performing Loan (NPL); Loan to Deposit Ratio (LDR); State-Owned Banks; Profitability.

This research is motivated by the profitability fluctuations of state-owned banks during the economic recovery period, which are highly susceptible to non-performing credit risks and liquidity management. This research aims to analyze the partial and simultaneous effects of the Non-Performing Loan (NPL) and Loan to Deposit Ratio (LDR) on the Return on Assets (ROA) of State-Owned Banks listed on the Indonesia Stock Exchange for the 2022–2025 period. Employing a quantitative approach, secondary data was collected from quarterly financial statements. The sample comprises 4 state-owned banks (Himbara) selected via purposive sampling. Following outlier elimination and AR (1) lag adjustment, a final sample of 56 observations was obtained. Data analysis was conducted using panel data regression with the Fixed Effect Model (FEM) applying White cross-section corrections via EViews 14. The t-test results reveal that NPL has a significant negative effect on ROA ($t = -3.4257$; $p = 0.0041$), while LDR exerts a significant positive effect on ROA ($t = 2.6160$; $p = 0.0203$). Simultaneously (F-test), NPL and LDR collectively have a significant effect on ROA with an F-statistic of 495.4271. Furthermore, the Adjusted R-Squared value of 0.9818 demonstrates that 98.18% of the variance in ROA is explained by NPL and LDR. The study concludes that state-owned banks must proactively suppress bad credit while optimizing fund disbursement expansion to maximize asset profitability.

INTRODUCTION

According to, the financial performance of banks is an illustration of the achievement of the success of banks in managing the resources they have, where (Kasmir, 2019) Return on Assets (ROA) is the main parameter to measure the extent to which a bank's assets are able to generate profits efficiently. But in practice, efforts to maintain this profitability stability are often faced with a dilemma between risk management and the fulfillment of the intermediation function. The appearance of a surge Non-Performing Loan (NPL) is a bad signal that indicates low credit quality, which will ultimately lower profit gains because banks have to allocate large amounts of productive asset write-off reserves. On the other hand, the bank's inability to maintain the Loan to Deposit Ratio (LDR) at an ideal level also triggers operational inefficiencies; Both due to the existence of unproductive funds and the risk of cash shortages due to overly aggressive credit distribution. The inequality between credit risk control and liquidity regulation is generally the root of the problem in maintaining the financial health of banks in a sustainable manner (Cecchetti, 2015; Dill, 2019; Oino, 2021; Van der Hoog, 2018).

Banking has a very important role in the macroeconomic system, especially as an intermediary institution that connects those who have excess funds with those who need funds. The role is not only limited to fundraising and disbursement activities, but also includes a strategic function in maintaining financial system stability through effective liquidity and risk management. In the Indonesian context, the existence of state-owned banks has a significant contribution to the banking industry because it is supported by large asset ownership and a wide range of credit distribution, so that the performance of these banks can be used as an indicator in assessing the overall health condition of the national banking (Kasmir, 2018)

According to (Power, 2023), Bank performance is generally measured through profitability ratios, one of which is Return on Assets (ROA). ROA shows the bank's ability to generate net profit from the total assets owned. The higher the ROA value, the more efficient the bank will be in utilizing its assets to make a profit.

According to (Kasmir, 2018), Non-Performing Loan (NPL) indicates the level of non-performing loans compared to the total loans provided. High NPLs indicate that the risk of default increases and can reduce profits due to loss reserves. In theory, an increase in NPLs tends to depress the bank's profitability.

In addition, Loan to Deposit Ratio (LDR) is a ratio used to measure a bank's ability to channel third-party funds into credit. LDR reflects the level of liquidity of the bank in carrying out the intermediation function. (Power, 2023)

In practice, efforts to achieve Return on Assets (ROA) is often hampered by declining quality of productive assets. explained that this condition is generally reflected in the increasing number of Non-Performing Loans (NPLs). In the 2022-2025 period as a transition period after the Covid-19 pandemic, banks, especially state-owned banks listed on the Indonesia Stock Exchange, are required to be more selective in disbursing loans to avoid a surge in non-performing loans after the end of the stimulus policy. The increase in NPLs directly encourages banks to form a large amount of Impairment Loss Reserves (CKPN), so that it becomes a burden on operating income which can ultimately erode profits and reduce the value of ROA. (Kasmir, 2019)

Liquidity aspects measured through Loan to Deposit Ratio (LDR) also plays a crucial role in determining the level of ROA. In the 2022–2025 period, competition conditions in third-party fundraisers are increasing in line with tightening liquidity, so banks must be able to maintain LDR balance. An LDR that is too high indicates that the bank is expansive but has liquidity risk, while an LDR that is too low reflects that the bank has not been optimal in carrying out its intermediation function so that the potential for interest income is not maximized. (Power, 2023)

In addition, the close relationship between NPLs and ROA in the state-owned bank group also depends heavily on risk management policies implemented during the economic recovery period. Non-performing credit management focuses not only on the collection process, but also on risk mitigation efforts from the outset through debtor feasibility analysis (Kasmir, 2018). In 2023, the increase in the benchmark interest rate will have an impact on increasing the cost of funds for state-owned banks such as BRI, Mandiri, BNI, and BTN listed on the Indonesia Stock Exchange to remain competitive. In 2023, the increase in the benchmark interest rate will have an impact on the increase in the cost of funds (cost of fund), so banks need to maintain LDR at an efficient level so that interest margins are maintained. Banks that

are able to manage LDRs in a balanced manner will have healthier financial performance because maintained liquidity can support operations without sacrificing profit opportunities from the credit sector.

The main problem faced by SOE Banks is how to synergize control (Power, 2023) Non Performing Loan (NPL) and optimization Loan to Deposit Ratio (LDR) simultaneously amid market volatility in the 2022–2025 period. The efficiency of asset management is highly dependent on the bank's ability to balance credit risk and liquidity risk, as an imbalance in either aspect will have a direct impact on the decline Return on Assets (ROA). This decline can ultimately trigger a negative reaction from shareholders as it is considered a signal of weakening managerial performance.

Research on the effect of Non-Performing Loans (NPL) and Loan to Deposit Ratio (LDR) on Return on Assets (ROA) in state-owned banks has been conducted by many researchers previously, but most of them still leave unfilled gaps. Safitri et al. (2025) and Hikmah Ramadhani et al. (2025) analyzed the influence of NPL, LDR, CAR, and BOPO on Bank HIMBARA's ROA for the period 2017–2024, while Hafizhah Fajriani & Janudin (2025) and Ratnasari et al. (2025) focused their research on one entity only, namely PT Bank Mandiri and PT Bank BNI separately. Some other studies such as Wirayudha et al. (2025) and Ardyani et al. (2025) did not include NPL variables in their models, while Enough Bhaktiar & Cassa Nova (2024) replaced NPL with Net Interest Margin (NIM) as an independent variable. The research of Ishak et al. (2024), Wahyuni et al. (2023), and Nurhidayah (2022) does have similarities in variables and objects with this study, but the data period used still ranges from 2013–2022, so it does not include the very crucial post-pandemic economic recovery period (2022–2025). Tirta Aji & Puspitaningrum (2025) also examined identical objects and variables, but using quarterly data with a different periodization approach. Thus, the novelty of this study lies in the use of the period 2022–2025, which is the post-pandemic recovery period for state-owned banks listed on the Indonesia Stock Exchange as a whole—not just one or two entities—so as to provide a more comprehensive picture of the influence of NPLs and LDRs on ROA during the dynamic economic transition period, which has not been explored much in previous research.

Research on (Kasmir, 2019) the influence of NPLs and LDRs on ROA in state-owned banks for the 2022–2025 period is very relevant to be conducted. This is due to the characteristics of state-owned banks which have a dual role, namely as government development agents as well as public companies that are required to generate profits for shareholders. Consistency of financial performance in the long term can only be achieved if banks are able to integrate credit risk management and liquidity management into business strategies that are adaptive to the dynamics of economic changes.

The 2022–2025 period is a period of post-pandemic economic recovery and global interest rate adjustments. This condition has the potential to affect the credit quality (NPL) and credit disbursement (LDR) policies of banks, which ultimately has an impact on ROA. In the 2022–2025 period, conditions in the field show interesting dynamics to be studied. If we look at the Gross NPL data on the four main state-owned banks, there is a significant variation in trends:

Regarding the trend of Gross NPLs for the 2022–2025 period, there is a difference in trend among the four major state-owned banks. If you look closely, Bank Mandiri recorded the

lowest ratio in terms of efficiency and improvement in the quality of productive assets. The trend of decreasing credit risk in this bank is not only sharp, but also shows a consistent decline every year. At the beginning of 2022, Mandiri's NPL ratio was still in the range of 1.8% to 1.9%, but through a series of strict risk management policies, the figure was successfully reduced to below 1% in 2024 and 2025. This drastic decrease indicates that Bank Mandiri is very selective in filtering potential debtors and has a very effective monitoring mechanism in detecting potential congestion early on.

Similar positive conditions were also shown by Bank BNI which showed a trend of continuous credit quality recovery. Although Bank BNI's NPL figure is still slightly above Bank Mandiri, BNI has managed to prove its commitment to maintaining the bank's fundamental stability by continuing to gradually reduce its non-performing loan ratio. From the range of 2.8% in 2022, BNI was able to bring it down to a level of around 2% by the end of 2024 and continue to be maintained until 2025. For investors on the stock exchange, this sustained downward trend signals confidence that BNI has a strong enough resilience to dynamic economic shocks, and is able to carry out optimal credit restructuring without having to sacrifice its liquidity.

It is different if we look at the performance of Bank BRI which has unique characteristics because of its large exposure to the micro sector and MSMEs. Data shows that the quality of BRI's assets tends to fluctuate and is full of challenges. After being at a moderate rate in 2022, Bank BRI had to record a significant increase in the non-performing loan ratio in 2023 to break through 3.12%. Although there were efforts to improve in 2024, the NPL position actually increased again in 2025 to exceed the level of 3.3%. These erratic fluctuations are a very clear indicator that the MSME sector as BRI's main engine is very vulnerable to changes in people's purchasing power and inflation, which ultimately has a direct impact on the inability of small debtors to meet their installment obligations on time.

The highest NPL ratio was recorded by Bank BTN, whose main focus is on housing financing or the property sector. Throughout the 2022-2025 observation period, BTN has consistently been in the position of the bank with the highest NPL ratio among other state-owned bank groups. There were indications of improvement when the congestion rate dropped to the level of 3% in 2023, but unfortunately the NPL ratio increased again to 3.20% in 2024 and continues to remain at a high figure until 2025. This shows that the property sector is still not fully recovering, where rising benchmark interest rates are often an additional burden for mortgage debtors, so the risk of default on banks remains a major threat that is difficult to mitigate instantly.

The difference in the level of ratios between these four banks ultimately raises the need to further examine their impact on the level of profitability of each entity. In accounting logic, banks with high persistently high NPLs such as BRI and BTN are certainly required to set aside a much larger amount of Impairment Loss Reserves (CKPN) to mitigate potential losses. This large reserve cost will automatically become a burden in the income statement which then erodes net profit and lowers the value of ROA. On the other hand, the efficiency carried out by Mandiri and BNI provides a competitive advantage because their reserve load is lighter, so that the assets owned can be more productive and generate profits. This difference in real conditions in the field is the foundation as well as the main urgency for researchers to study further in this study. The researcher wants to prove how much the real influence of the volatility of bad credit

rates and liquidity regulation on the ability of these state-owned banks to generate maximum profits for the state and public shareholders in the midst of economic dynamics for the 2022–2025 period.

This research departs from the phenomenon of fluctuations in the financial performance of state-owned banks which is reflected in the Return on Assets (ROA) which is still unstable, even though its status as a state-owned bank should provide a firmer foundation in managing assets into profits. These fluctuations are strongly influenced by two main factors, namely the high ratio of non-performing loans (NPLs) that force banks to set aside large reserve funds and reduce profits, as well as the dilemma in maintaining a balance between the aggressiveness of lending (Loan to Deposit Ratio / LDR) and the adequacy of liquidity which is often a tough challenge for management. The lack of empirical studies that specifically examine the influence of NPLs and LDRs on ROA in state-owned banks in the post-pandemic period (2022–2025) is an important gap underlying this study, considering that this period is crucial to understand the dynamics of economic recovery in the national banking sector.

To ensure an in-depth and targeted analysis, this study is limited to the objects of state-owned banks listed on the Indonesia Stock Exchange with an observation period of 2022–2025, and uses Non-Performing Loan and Loan to Deposit Ratio as independent variables and Return on Assets as dependent variables. Based on these limitations, this study was formulated to answer three main questions, namely whether NPLs affect ROA, whether LDRs affect ROAs, and whether NPLs and LDRs simultaneously affect ROA. In line with the formulation of the problem, the purpose of this study is to empirically examine the partial influence of NPLs and LDRs on ROA, as well as the simultaneous influence of these two variables on the financial performance of SOEs in the 2022–2025 period, so that it is expected to be able to contribute to management decision-making in maintaining bank stability and profitability in the midst of dynamic economic challenges. The results of this study are expected to provide theoretical benefits in the form of enrichment of literature and testing the consistency of banking financial management theories in the post-pandemic period (2022–2025), as well as practical benefits for the management of state-owned banks as material for credit risk and liquidity policy evaluation, for investors as considerations in investment decision-making, and for regulators (OJK and Bank Indonesia) as input in the supervision and formulation of macroprudential policies for maintaining the stability of the national banking system as a whole.

METHOD

This research was conducted by accessing secondary data through the official website of the Indonesia Stock Exchange (www.idx.co.id) as well as the official website of each state-owned bank that was sampled, with data collected in the form of quarterly financial statements for the period 2022 to 2025, and the research time, which includes the stages of data collection, processing, and preparation of the final report, planned to last for four months starting from February to May 2026. The research method is basically a planned scientific way to obtain data in order to achieve a certain goal, and based on this approach, this study applies a quantitative method with a descriptive approach to test the relationship between variables statistically (Sugiyono, 2020), which aims to explain or provide an in-depth description of the condition of an object of observation through the facts found, whereby the researcher processed secondary data in the form of financial ratio figures without intervening in the variables studied, but

focused on the analysis of the financial performance of state-owned banks that had been officially published (Sujarweni, 2020). The population in this study is all State-Owned Enterprises (SOEs) Banks listed on the Indonesia Stock Exchange (IDX) in the 2022-2025 period (Scott, 2020), and given that the number of state-owned banks listed on the stock exchange is limited to only 4 banks, the researcher used a saturated sampling technique, as explained by Scott (2020) and Sujarweni (2020), where saturated sampling is a sample determination technique when all members of the population are used as samples. Researchers still applied certain criteria through purposive sampling to maintain data quality, as explained by Scott (2020), where purposive sampling is a sample determination technique with certain considerations, including the bank being a state-owned entity active on the stock exchange during the 2022-2025 period, the bank publishing quarterly financial statements consistently, and the bank including complete data related to the ratio of NPLs, LDRs, and ROAs, and based on these criteria, all four state-owned bank companies listed on the IDX met the requirements, with none excluded due to incomplete quarterly data, resulting in a research sample of 4 companies observed over a research period of 4 years across 4 quarters, or 64 total quarterly financial statement observations (Researcher-Processed Data, 2026).

RESULTS AND DISCUSSIONS

Overview and Description of Research Object

This study aims to analyze the influence of Non Performing Loan (NPL) and Loan to Deposit Ratio (LDR) against Return on Assets (ROA) in the group of State-Owned Enterprises (SOEs) listed on the Indonesia Stock Exchange (IDX) for the 2022–2025 period. The research objects include four main state-owned banking entities (HIMBARA), namely:

1. PT Bank Negara Indonesia (Persero) Tbk (BBNI)
2. PT Bank Mandiri (Persero) Tbk (BMRI)
3. PT Bank Rakyat Indonesia (Persero) Tbk (BBRI)
4. PT Bank Tabungan Negara (Persero) Tbk (BBTN)

The data used is secondary panel data in the form of quarterly financial statements (quarterly) from Q1-2022 to Q4-2025. From the total initial population of 64 observations (4 banks $\times$ 4 years $\times$ 4 quarters), data cleaning procedures were carried out (data screening) by removing 4 isolated data points (outliers) in order to meet the criteria of econometric assumptions. The four data released include Bank Mandiri in the first quarter of 2024, Bank Mandiri in the first quarter of 2025, Bank BRI in the first quarter of 2025, and Bank BRI in the second quarter of 2025. Thus, the number of final analysis units processed using the EViews program was 56 unbalanced panel data samples (unbalanced panel).

Panel Data Regression Model Selection

Determining the best model specification in panel data regression involves a series of formal tests. This study uses the Chow Test and the Hausman Test to choose between the model Common Effect, Fixed Effect, or Random Effect.

Chow Test (Redundant Fixed Effects Test)

The first test was conducted to compare the compatibility between the Common Effect Model (CEM) with Fixed Effect Model (FEM). The criterion for taking it is to look at the probability of Cross-section F.

Redundant Fixed Effects Tests

Equation: Untitled

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	241.955376	(3,54)	0.0000
Cross-section Chi-square	160.208294	3	0.0000

Cross-section fixed effects test equation:

Dependent Variable: ROA_Y

Method: Panel Least Squares

Date: 07/27/26 Time: 15:16

Sample: 2022Q1 2025Q4

Periods included: 16

Cross-sections included: 4

Total panel (unbalanced) observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.63965	2.093766	7.469625	0.0000
NPL_X1	-0.479096	0.132734	-3.609458	0.0006
LDR_X2	-0.131707	0.023602	-5.580247	0.0000

R-squared0.475128

Adjusted R-squared0.456711

S.E. of regression0.836351

Sum squared resid39.87050

Log likelihood-72.87508

F-statistic25.79891

Prob(F-statistic)0.000000

Mean dependent var2.589500

S.D. dependent var1.134679

Akaike info criterion2.529169

Schwarz criterion2.633887

Hannan-Quinn criter.2.570130

Durbin-Watson stat0.478834

Figure 1. Hasil Uji Chow (Redundant Fixed Effects Tests)

Source: Output of EViews 14 data processing, 2026

Based on the test output in Figure 1 above, the probability value of Cross-section F shows the number 0.0000. Since this number is smaller than the significance level of 5% (0.05), H_0 is rejected. In conclusion, a more feasible model to use to estimate this panel data is the Fixed Effect Model (FEM).

Uji Hausman (Correlated Random Effects Test)

Since the Chow Test leads to a Fixed Effect, the next stage is to conduct the Hausman Test to compare the feasibility of the Fixed Effect Model (FEM) against the Random Effect Model (REM).

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.	
Cross-section random	21.058923	2	0.0000	

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
NPL_X1	-0.028709	-0.087356	0.000518	0.0100
LDR_X2	-0.001677	-0.007820	0.000003	0.0001

Cross-section random effects test equation:

Dependent Variable: ROA_Y

Method: Panel Least Squares

Date: 07/27/26 Time: 15:10

Sample: 2022Q1 2025Q4

Periods included: 16

Cross-sections included: 4

Total panel (unbalanced) observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.814270	0.893010	3.151444	0.0027
NPL_X1	-0.028709	0.081727	-0.351276	0.7267
LDR_X2	-0.001677	0.008772	-0.191213	0.8491

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.963656	Mean dependent var	2.589500
Adjusted R-squared	0.960291	S.D. dependent var	1.134679
S.E. of regression	0.226108	Akaike info criterion	-0.040969
Sum squared resid	2.760740	Schwarz criterion	0.168466
Log likelihood	7.229067	Hannan-Quinn criter.	0.040952
F-statistic	286.3641	Durbin-Watson stat	0.735702
Prob(F-statistic)	0.000000		

Figure 2. Hausman Test Results (Correlated Random Effects Test)

Source: Output of EViews 14 data processing, 2026

The Hausman Test Table in Figure 2 records a probability value (Prob.) of 0.0000. A value that is well below the threshold of 0.05 proves that H0 is rejected. Thus, statistically Fixed Effect Model (FEM) proved to be the most consistent and best model for responding to research objectives.

Classic Assumption Test

To ensure that the parameters generated by the Fixed Effect Model unbiased, the model must pass the statistical prerequisite test.

1. Normality Test

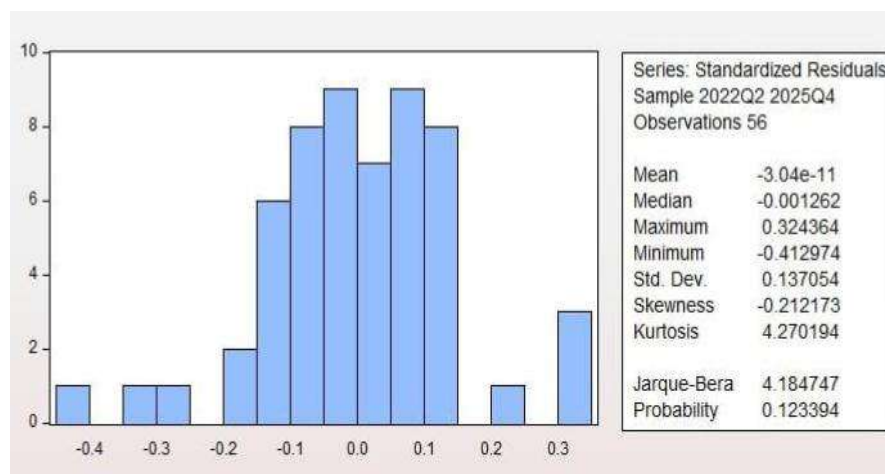


Figure 3. Residual Normality Test Results

Source: Output of EViews 14 data processing, 2026

Based on the histogram graph in Figure 3 above, the statistical value of Jarque-Bera is 4.184747 with a probability value (Probability) by 0.123394. Since the probability value is

greater than the significance level of 0.05 ($0.123394 > 0.05$), it can be concluded that the residual values in this regression model are normally distributed.

2. Multicollinearity Test

	NPL_X1	LDR_X2
NPL_X1	1.000000	0.154056
LDR_X2	0.154056	1.000000

Figure 4. Multicollinearity Test Results

Source: Output of EViews 14 data processing, 2026

Based on the test results in the correlation matrix table above, it can be seen that the correlation value between independent variables, namely between Non Performing Loan (NPL) and Loan to Deposit Ratio (LDR), is 0.154056. Referring to the test criteria, a good regression model should not have a perfect correlation between independent variables or the correlation value is below the limit of 0.90. Since the correlation value of 0.154056 is much smaller than 0.90, it can be concluded that there are no symptoms of multicollinearity that harm the model, so the classical assumption of multicollinearity is well fulfilled.

3. Heteroscedasticity Test

Dependent Variable: ABS(RESID)				
Method: Panel Least Squares				
Date: 08/03/26 Time: 07:20				
Sample: 2022Q1 2025Q4				
Periods included: 16				
Cross-sections included: 4				
Total panel (unbalanced) observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.526027	1.125839	1.355457	0.1806
NPL_X1	0.168363	0.071372	2.358943	0.0218
LDR_X2	-0.014391	0.012691	-1.133940	0.2616
R-squared	0.097712	Mean dependent var		0.671990
Adjusted R-squared	0.066053	S.D. dependent var		0.465346
S.E. of regression	0.449714	Akaike info criterion		1.288298
Sum squared resid	11.52784	Schwarz criterion		1.393015
Log likelihood	-35.64893	Hannan-Quinn criter.		1.329258
F-statistic	3.086381	Durbin-Watson stat		1.253875
Prob(F-statistic)	0.053374			

Figure 1. Heteroscedasticity Test Results

Source: Output of EViews 14 data processing, 2026

The heteroscedasticity test in this study was carried out using the Glejser Test, which is by regressing the absolute residual value of ABS (RESID) to an independent variable. The table of test results above shows that the probability value for the Non Performing Loan (NPL) variable is 0.0218. Given that the probability value is smaller than the significance level of 0.05 ($0.0218 < 0.05$), it can be concluded that there are indications of symptoms of variance inequality (heteroscedasticity) in the initial regression model. These findings are a strong foundation why the processing of final stage panel data must be corrected using the White cross-section standard errors & covariance approach so that the estimation parameters remain valid and robust (immune) to the variance interference.

4. Autocorrelation Test

Dependent Variable: ROA_Y				
Method: Panel Least Squares				
Date: 08/03/26 Time: 07:29				
Sample: 2022Q1 2025Q4				
Periods included: 16				
Cross-sections included: 4				
Total panel (unbalanced) observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.63965	2.093766	7.469625	0.0000
NPL_X1	-0.479096	0.132734	-3.609458	0.0006
LDR_X2	-0.131707	0.023602	-5.580247	0.0000
R-squared	0.475128	Mean dependent var		2.589500
Adjusted R-squared	0.456711	S.D. dependent var		1.134679
S.E. of regression	0.836351	Akaike info criterion		2.529169
Sum squared resid	39.87050	Schwarz criterion		2.633887
Log likelihood	-72.87508	Hannan-Quinn criter.		2.570130
F-statistic	25.79891	Durbin-Watson stat		0.478634
Prob(F-statistic)	0.000000			

Figure 2. Autocorrelation Test Results

Source: Output of EViews 14 data processing, 2026

Autocorrelation testing aims to see if there is a correlation between disruptive errors in the current period and the previous period, which is common in the observation of consecutive quarterly time series data. Based on the results of the initial regression test in the table above, the Durbin-Watson stat value was obtained of 0.478634. Referring to the Durbin-Watson test decision-making criteria, a value of d that is between 0 and the lower limit (dl) indicates the presence of positive autocorrelation symptoms. The value of 0.478634 which is far from the number 2 proves that the initial regression model is infected with autocorrelation problems. Therefore, to cure this violation of this classic assumption, the processing of the late-stage panel data regression model must include a first-order Autoregressive component or AR(1) in order for the estimation results to be valid.

Panel Data Regression Analysis and Hypothesis Testing

Once the model is confirmed to be clean of violations of classical assumptions, the table below shows the final estimate results using Fixed Effect Model that has been corrected with AR(1) and approaches White cross-section:

Dependent Variable: ROA_Y
Method: Panel Least Squares
Date: 07/27/26 Time: 15:19
Sample (adjusted): 2022Q2 2025Q4
Periods included: 15
Cross-sections included: 4
Total panel (unbalanced) observations: 56
White cross-section (period cluster) standard errors & covariance (d.f. corrected)
Convergence achieved after 15 iterations
Standard error and t-statistic probabilities adjusted for clustering

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.292856	1.051458	1.229584	0.2391
NPL_X1	-0.523386	0.152782	-3.425693	0.0041
LDR_X2	0.024119	0.009220	2.615973	0.0203
AR(1)	0.903196	0.070621	12.78933	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.983783	Mean dependent var	2.589643
Adjusted R-squared	0.981797	S.D. dependent var	1.143483
S.E. of regression	0.154275	Akaike info criterion	-0.783693
Sum squared resid	1.166236	Schwarz criterion	-0.530524
Log likelihood	28.94341	Hannan-Quinn criter.	-0.685540
F-statistic	495.4271	Durbin-Watson stat	1.976848
Prob(F-statistic)	0.000000		

Inverted AR Roots

.90

Figure 3. Fixed Effect Model (FEM) Regression Estimation Results with AR(1) and White Cross-section Correction

Source: Output of EViews 14 data processing, 2026

Based on the estimation table in Figure 7 above, the multiple linear regression equation formed is: $ROA = 1.292 - 0.523 \text{ NPL} + 0.024 \text{ LDR} + e$

F Test (Simultaneous Influence)

This test aims to see whether NPLs and LDRs simultaneously affect the profitability of state-owned banks. Based on the output, the Prob(F-statistic) value is at 0.000000 (< 0.05). These results confirm that simultaneously, the rise and fall of the non-performing loan ratio and the disbursement of credit have a very real impact on the movement of Return on Assets (ROA).

Koefisien Determinasi (Adjusted R-squared)

The Adjusted R-squared value was recorded at 0.9817 or 98.17%. This figure proves that the ability of the NPL and LDR variables to predict variations in bank profitability is very strong. As many as 98.17% of the changes in the ROA of state-owned banks can be explained by this model, while the remaining very small portion (1.83%) is influenced by macroeconomic factors or other financial indicators outside the focus of the study.

T test (Partial Influence)

Partial testing was performed to see the direction and significance of each independent variable to the ROA:

1. Effect of NPL on ROA The results of data processing showed a negative NPL coefficient of -0.5233 with a probability level of 0.0041. Since 0.0041 is smaller than 0.05, the first hypothesis is supported. Credit risk (NPL) has been proven to have a negative and significant effect on ROA.
2. The effect of LDR on ROA The LDR variable recorded a positive coefficient value of 0.0241 with a probability level of 0.0203. A probability number below 0.05 indicates that the second hypothesis is accepted. Credit disbursement (LDR) has been proven to have a positive and significant influence on the growth of ROA.

The Effect of Non-Performing Loans (NPLs) on Return on Assets (ROA)

Statistical findings prove that the higher the NPL figure, the more depressed the bank's profitability will be. Rationally, the high number of bad loans forces the bank's management to set aside more funds to form a Reserve for Impairment Losses (CKPN). The allocation of reserve funds ultimately cuts the portion of operating income, so that the net profit or ROA of state-owned banks automatically decreases.

The Effect of Loan to Deposit Ratio (LDR) on Return on Assets (ROA)

The direction of the positive relationship in the LDR variable reflects that state-owned banks that are aggressive but remain cautious in throwing loans will reap thicker profits. The increase in the LDR figure shows the success of the bank in turning public trust funds (DPK) into productive assets in the form of loans. The optimization of this intermediation function directly contributes to the flow of interest income, which in turn has a positive impact on the increase in the ROA rate.

Simultaneous Effect of NPL and LDR on Return on Assets (ROA)

Simultaneously, NPLs and LDRs have proven to be the main determinants of the profitability of state-owned banks. Value Adjusted R-squared which reached 98.39% confirmed that the bank's financial performance is the result of an optimal balance between credit risk management (reducing NPLs) and expanding the intermediation function (optimizing LDR). State-owned banks that are able to balance these two functions will result in sustainable net profit growth.

CONCLUSION

This study aims to analyze the effect of Non-Performing Loan (NPL) and Loan to Deposit Ratio (LDR) on Return on Assets (ROA) in State-Owned Banks (BNI, Mandiri, BRI, and BTN) listed on the IDX for the 2022–2025 period. Based on the regression of the Fixed Effect Model (FEM) method panel data on 56 observation samples, it was found that partially NPL had a negative and significant effect on ROA with a coefficient of -0.5233 ($t=-3.4257$; $p=0.0041$), which means that every 1% increase in NPL decreases ROA by 0.5233% due to an increase in the burden of Impairment Loss Reserves (CKPN) which cuts operating profits. On the other hand, LDR had a positive and significant effect on ROA with a coefficient of 0.0241 ($t=2.6160$; $p=0.0203$), showing that the optimization of the intermediation function through effective credit distribution was able to encourage an increase in net profit. Simultaneously, NPLs and LDRs together had a significant effect on ROA ($F=495.4271$; $p=0.0000$) with an Adjusted R-squared value of 98.18%, indicating that almost all variations in the profitability of state-owned banks are explained by these two variables, while the rest are influenced by other factors outside the model. Based on these findings, it is recommended for the management of state-owned banks (especially BRI and BTN) to tighten credit risk mitigation early on to reduce NPLs and minimize the burden on CKPN, as well as maintain the LDR at the optimal range so that public funds do not settle in vain and continue to generate maximum interest income. For investors, it is advisable to look closely at the ratio of NPLs and LDRs simultaneously before investing, with banks that consistently depress low NPLs and maintain intermediation expansion (such as Mandiri and BNI) offering security and more assured long-term profitability growth. For regulators (OJK and Bank Indonesia), macroprudential supervision needs to be strengthened to ensure that the NPLs of all state-owned banks are below the 5%

threshold and credit disbursement is still supported by sufficient liquidity for the stability of the national financial system. As for the next researcher, it is recommended to expand the research period, add independent variables such as CAR, NIM, BOPO, or macroeconomic variables (BI-Rate and Inflation), and expand the object of research by comparing state-owned banks and National Private Commercial Banks KBMI class 4 to enrich the comparative study of banking financial performance in a more comprehensive manner.

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